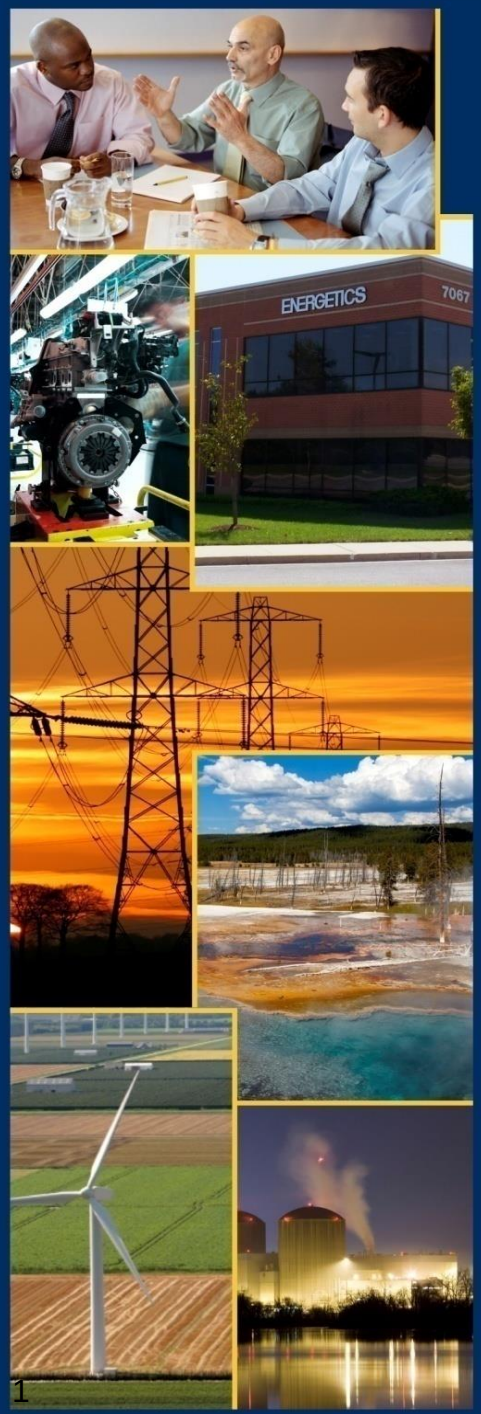


# MARYLAND ELECTRIC VEHICLE INFRASTRUCTURE COUNCIL

## *City of Frederick EV Charging Infrastructure Plan – Process and Results Summary*

March 15, 2018

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Technical Team Lead
Transportation Technologies
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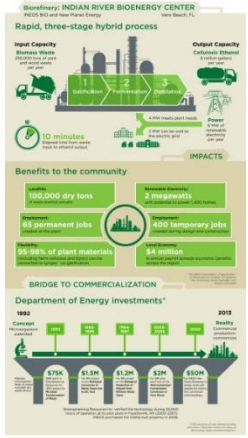
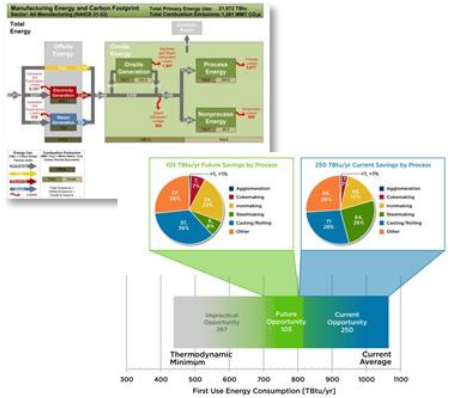
# Energetics at a Glance

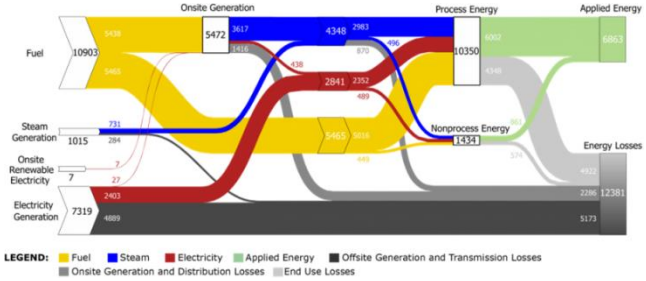
## Providing clients with solutions that:

- Increase energy efficiency
- Diversify energy supply
- Measure impacts of new energy technologies
- Benchmark energy and carbon footprints
- Create consensus around strategic priorities
- Modernize infrastructure






## 80+ staff members include engineers, scientists, project managers, and communication specialists

- **30+ Subject Matter Experts:**
  *Advanced Manufacturing, Energy Management, Wind, Solar, Bioenergy, Battery Storage, CHP, Fuel-efficient Vehicle Technologies, Green Building Technologies, Smart Grid, Climate Change Adaptation, and Policy/Regulatory Affairs*
- **Over 50% with Advanced Degrees** *(Ph.D., J.D., M.S.)*
- **55 BS/BA Engineering/Science Degrees**
- **Certifications including PMP, PE, CEM, LEED, CMVP**

**Integrated delivery of technical, analytical, and communication services for over 39 years**

# Government Clients

65 Government Clients

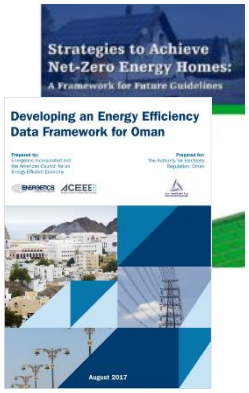
# Commercial Clients

184 Commercial Clients

# Energetics Business Areas

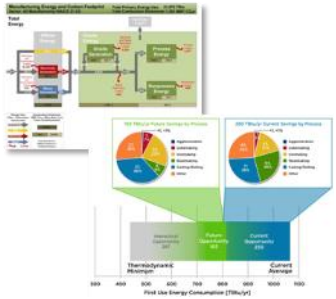
- CLIMATE CHANGE/ SUSTAINABILITY
- CRITICAL INFRASTRUCTURE RESILIENCE AND CYBERSECURITY
- ENERGETICS INNOVATION PRACTICE
- ENERGY EFFICIENCY
- GRID MODERNIZATION
- INDUSTRIAL
- RENEWABLE ENERGY
- TRANSPORTATION

# Energetics Service Offerings




**Planning & Roadmapping**

**Analysis & Modeling**



NIST National Institute of Standards and Technology U.S. Department of Commerce

U.S. DEPARTMENT OF ENERGY

NEW YORK STATE OF OPPORTUNITY. NYSERDA

GCC Governments

FEMP Federal Energy Management Program

SMARTGRID.GOV

STATE OF CALIFORNIA ENERGY COMMISSION

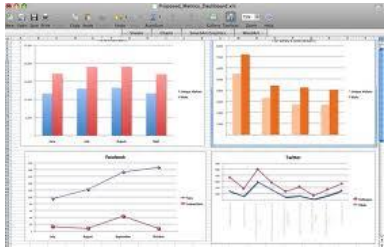
CLEAN ENERGY MINISTERIAL

Private Clients

**Implementation & Deployment**

**Outreach & Communications**

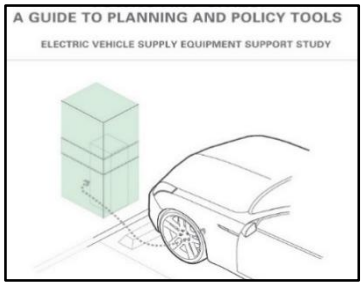

**Evaluation & Metrics**



# Sustainable Transportation Division

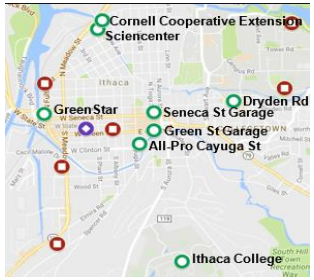
- 22 engineers and scientists focused on sustainable transportation solutions
- 35+ years experience supporting **U.S. DOE Vehicle Technology Office**
- 10+ years supporting the **State of New York** (**New York State Energy Research & Development Authority** and **NYSDOT**)
- Subject matter technical expertise:
  - Electric Transportation and Charging Infrastructure
  - Plug-In Hybrid Electric and Battery Electric Vehicles
  - Conventional, Hybrid-Electric, and Hydraulic Hybrid Powertrains
  - Advanced Combustion Engines, and Emission Control
  - Petroleum and Alternative Fuels
  - Power Electronics and Electric Motors
  - Energy Storage Systems
  - Hydrogen and Fuel Cells

# Energetics EV Experience




**Creating EV-Ready Towns and Cities**


**Best Practices for EV Charging**



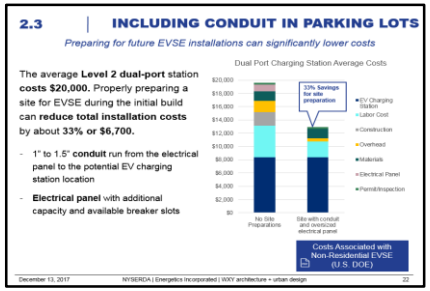

**Tompkins County EV Infrastructure Plan**


**EV Plans for I-90 Regions**


**Promoting Workplace Charging**

**EVSE Deployment Program Support (700+ Charging Ports)**


**EV Tourism in New York State**




**EV Education and Tools for Planning Board Members**

**Animating the EV Market**

# City of Frederick Project Objective/Team

The Plan's purpose is to inform the City to make informed Plug-In Electric Vehicle (PEV) charging infrastructure implementation decisions including: 1) available technology,2) benefits, 3) deployment options, 4) lessons learned from others, and 5) how planning for PEVs can shape the City's planning.

**City of Frederick** – Sustainability Program (lead), Planning Department, Electrical Department, Department of Public Works, Parking Department

**Energetics** (Prime) – Leveraged proven PEV charging infrastructure plan process used for Tompkins County and regional charging station roadmaps along Interstate 90 (New York State)

**Vision Engineering & Planning** (Sub) – Transportation engineering and planning. Demographics and travel demand baseline/projections expert

# Process – Determine Baseline

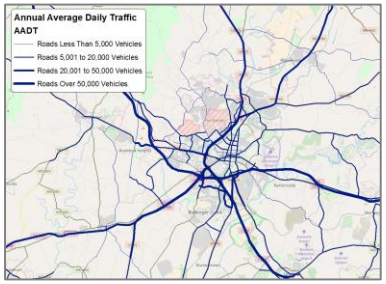
- Background information (to inform client) on:
  - **PEV types** – BEV and PHEV; basic vehicle specs(battery capacity, driving range, difference, charging types, charging times)
  - **Charging station types** – i.e., 110 VAC outlet and onboard cordset, AC Level 1, AC Level 2, DC Fast Charge; managed and un-managed; connector types & interoperability
  - Summarize EVSE **maintenance** and **repair** needs
- Determine population, households (#people, # vehicles), employment demographics → GIS map by TAZ
- **Vehicle population**
  - All vehicle types (conventional, BEV, PHEV, and HEVs) by zip code (from MVA) → GIS map by TAZ
  - Compare City to nearby counties/cities
- **Roadway volumes** – Identify major corridors

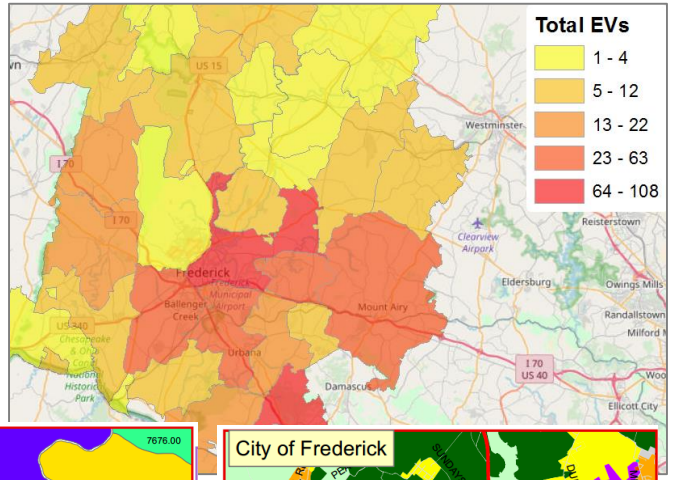
# Process – Determine Baseline

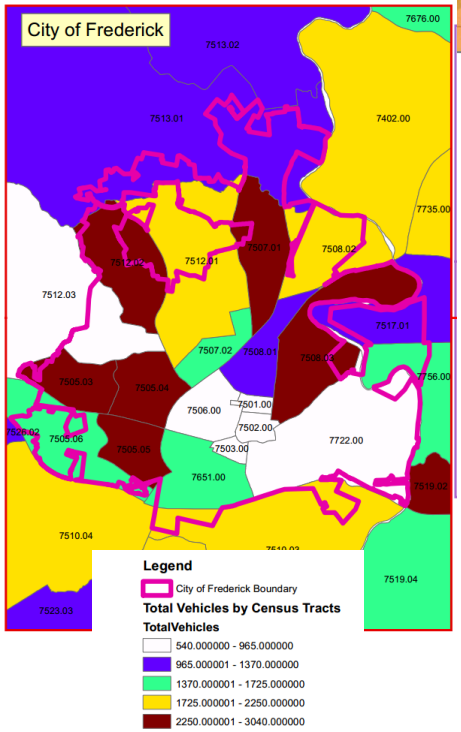
**Majority** of Frederick County PEVs are in the City of Frederick

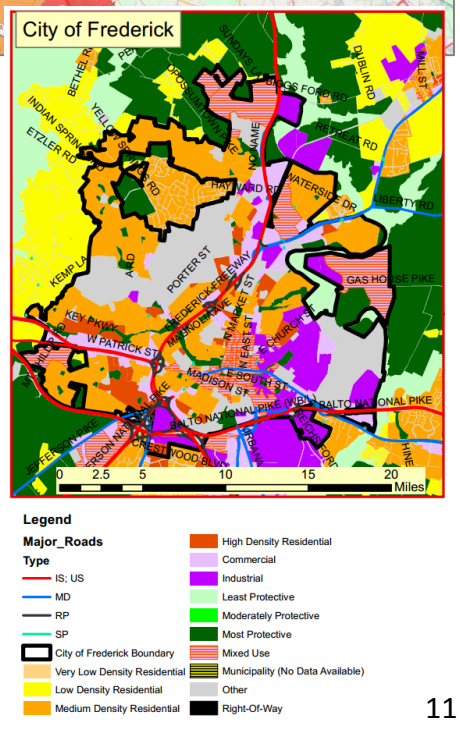
| | Frederick | | |
|---|---|---|---|
| | County | City | |
| BEV | 124 | **68** | **55%** |
| PHEV | 287 | **171** | **60%** |
| Total PEV | 411 | **239** | **58%** |

| | BEV | PHEV | Total PEV | % of Total Vehicles |
|---|---|---|---|---|
| Frederick | **124** | **287** | **411** | **0.2%** |
| Washington | 19 | 60 | 79 | 0.1% |
| Carroll | 44 | 122 | 166 | 0.1% |
| Howard | 419 | 583 | 1,002 | ***0.4%*** |
| Montgomery | 1,527 | 1,652 | 3,179 | ***0.5%*** |




**Income –** Current PEV owners are typically higher income households. (Expected to change over time.)

**PEV potential –** Areas with higher numbers of HEVs demonstrate a larger near-term potential PEV potential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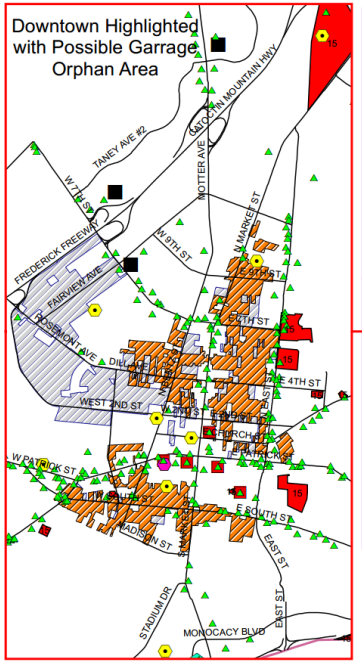
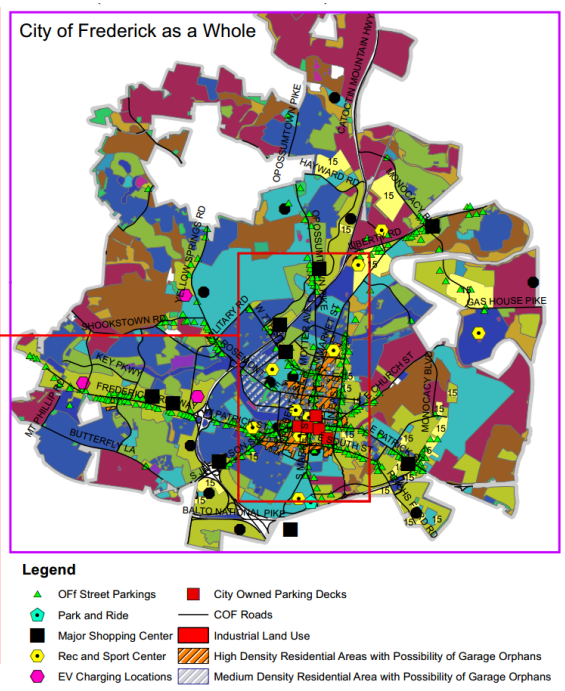
# Process – Determine Baseline

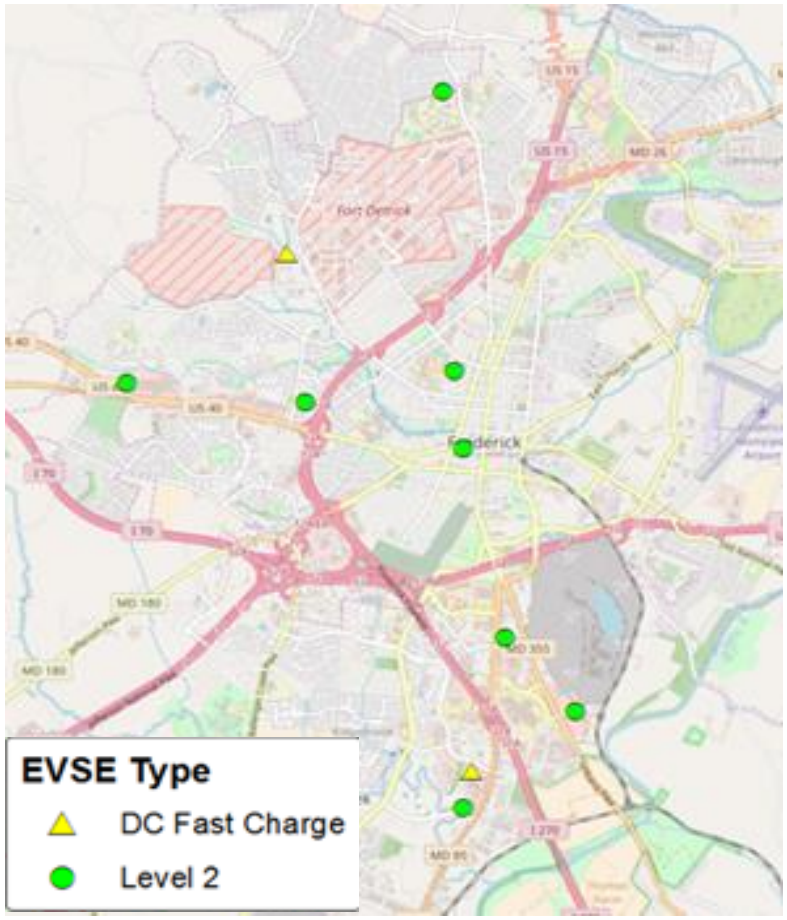
- **Public Parking Inventory**
  - Identify *Garage Orphans* (higher density populations with limited/no home charging access) Frederick requirement, but relevant for built out urban areas where parking spots are not dedicated (street, lot, etc.)
- **PEV Dealers**
  - Phone/in-person survey of local dealerships who sell PEVs – talk to sales staff for: 1) PEV knowledge, 2) incentive knowledge, 3) PEV specialists, 4) observe PEVs placement on showroom/lot. → Informs Outreach/Education efforts
  - Online inventory search to show PEV stock.



# Process – Determine Baseline

- **Installed EVSE**
  - Survey each installed chargers (charge level, location, accessibility, signage, etc.) (Plugshare, AFDC, etc.)
  - Speak to staff to ask about permitting/installation process and issues (none knew)
- **Lessons Learned** – Identify available lessons learned from similar/relevant areas *(Energetics Clean Cities support very helpful.)*



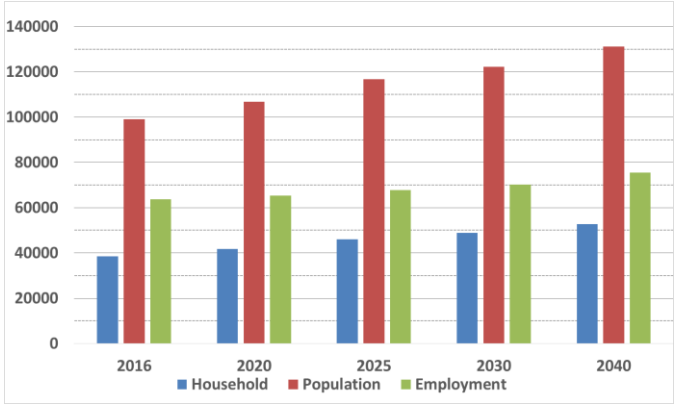
# Process – Determine Baseline

- **Identify unique considerations/requirements**: 1) Historic district, 2) natural conservation areas, 3) etc.
- **Identify unique concerns**:1) Public parking spot turnover, 2) charging a fee, 3) personal charging cords crossing City-owned sidewalks, 4) parking garage space management, 5) etc.
- **Review existing** (staff feedback/input if possible)
  - **Permitting/Inspection** – EVSE installation permitting process (residential and commercial) → Streamline permitting to encourage installations
  - **Zoning** – Determine potential EVSE barriers (incl. Historic District)
  - **Codes** – Identify if there are code requirements for installing charging infrastructure (electrical panel capacity/breakers, conduit, wire, receptacle, etc.) – Dedicated Parking and Shared Parking
  - **Parking Enforcement Approach** – Helps ensure charging station availability

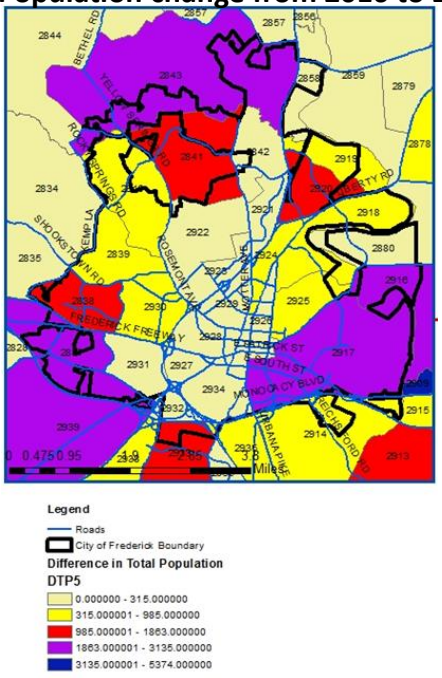
# Process – Projections

**<u>Use MWCOG data to project</u>**: 1) population, 2) households (#people, # vehicles), 3) employment, 4) roadway volumes

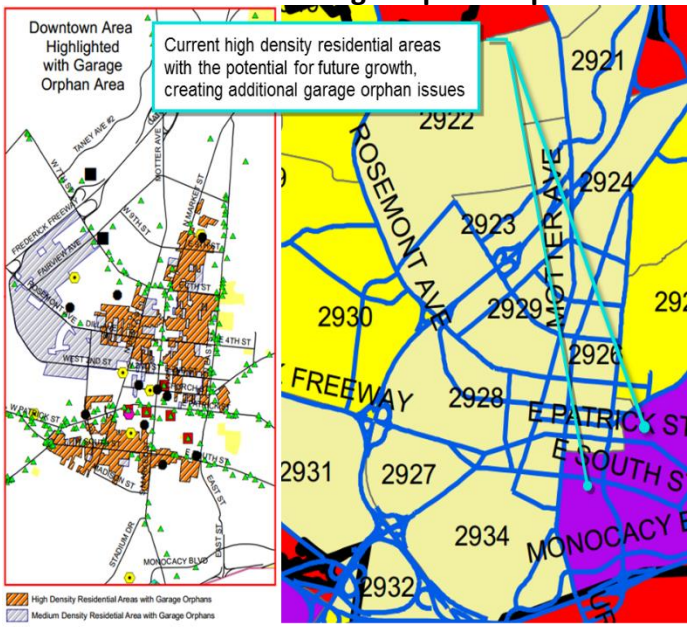
- Shows where, and when, changes are projected to happen to focus efforts

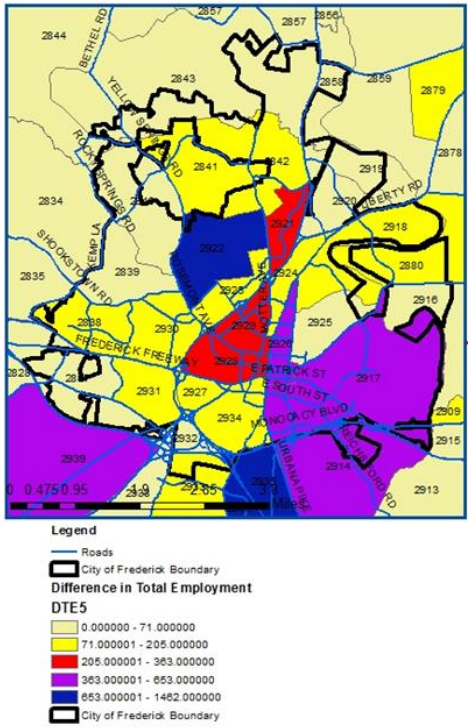



**Population change from 2016 to 2030**



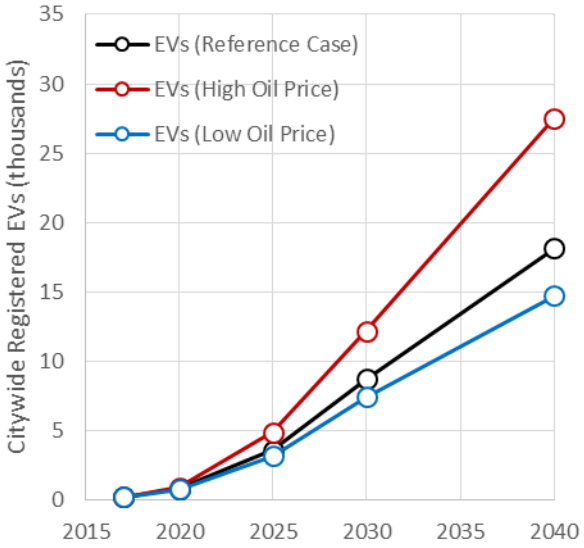

**Potential Increased Garage Orphan Population**



# Process – Projections

- **PEV population** – Use U.S. Energy Information Administration (EIA) data to estimate PEV vehicle population (reference, low, and high oil cases to bound results), +5-35 years
- **PEV charging** – ~60% (Home), ~35% (workplace), ~5% (public); assuming 50% of public is on City property




**PEV Population Projections**

| Case | 2017 | 2020 | 2025 | 2030 | 2040 |
|---|---|---|---|---|---|
| Low Oil | 239 | 793 | 3,172 | 7,437 | 14,709 |
| Reference | 239 | 793 | 3,612 | 8,709 | 18,133 |
| High Oil | 239 | 793 | 4,898 | 12,198 | 27,525 |

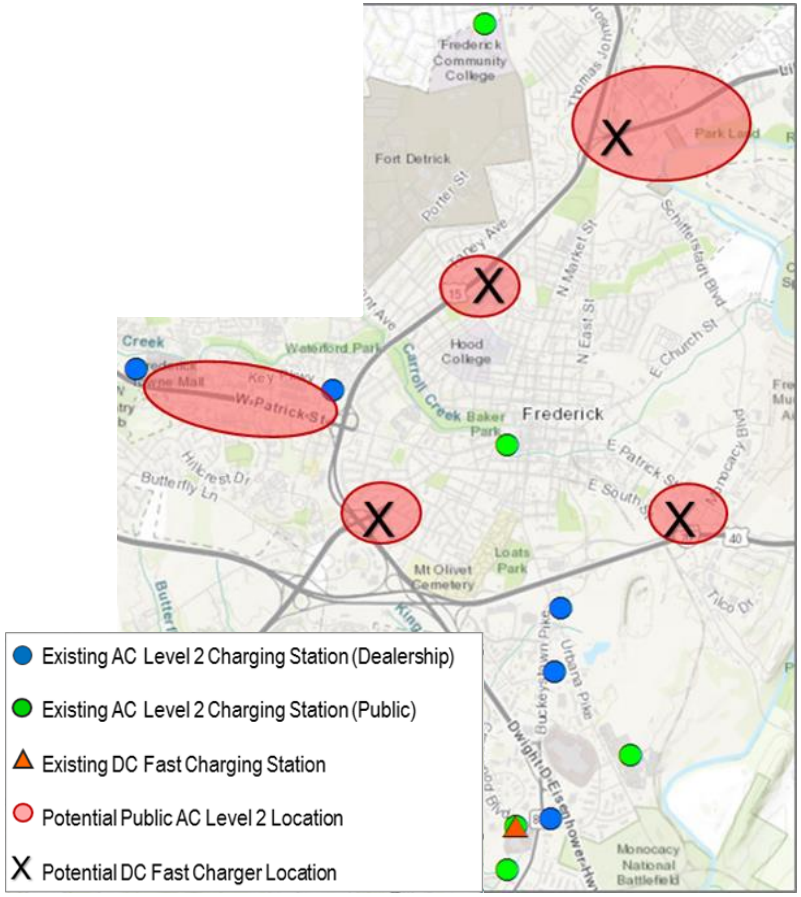
**PEV Population Needing Daily Public Charging at City Garages/Lots (50% of public charging)**

| Case | 2017 | 2020 | 2025 | 2030 | 2040 |
|---|---|---|---|---|---|
| Low Oil | 6 | 20 | 80 | 186 | 368 |
| Reference | 6 | 20 | 91 | 218 | 454 |
| High Oil | 6 | 20 | 123 | 305 | 688 |

# Process – Projections – Chargers

## Public charging locations

- **DCFC** – Shopping centers/full-service gas stations
- **AC Level 2** – Retail locations, restaurants
- **AC Level 1** – Daily/overnight parking for work and garage orphans, transit stations




## Some projects include

- High-level site-suitability screen
- Initial technical analysis to determine installation requirements

# Process – Projections – Chargers

Provide suggested options for MDU (right) and streetside (below) charging



# Process – PEV Promoting Actions

## Education and Outreach

- **Public**: 1) City PEV Informational and Outreach Website, 2) PEV stakeholder working group, and 3) broad education and outreach marketing campaign,
- **City staff**: 1) educate Permitting, Inspection, Parking, Planning, etc. staff, about PEVs and charging stations and 2) technical training for required staff

## Partnership Development

- 1) Community organizations, 2) Potomac Edison electric utility, 3) property developers/managers (MDU, workplace, etc.), 4) employers, and 5) retail property owners/managers for potential public charging installations
- Supports Outreach/Education to show why private investment to install chargers is good for residents/business

# Process – PEV Promoting Actions

## Grant Opportunities

- *Develop a plan for installing charging stations in the City-owned garages and lots.*
- *Plan should also include other public charging locations*, including DCFCs to be comprehensive.
- Ensures that the necessary information and partnerships needed are ready to quickly react when funding becomes available (VW, MEA, EPA DERA, MD utilities, etc.).

# Process – Code, Inspection, and Zoning Recommendations

## Codes

- **Dedicated parking** *(Single-family house/townhouse [garage, carport, driveway])* **|| Shared Parking** *(townhouse, multi-dwelling units)* – Consider requiring charging infrastructure (electrical panel, conduit, wire, receptacle, etc.) at all/% of new construction, and major upgrade projects
- **Streetside charging** – develop method for residents to install private charging on city right-of-way (supports garage orphans)

## Permits/Inspection

- If the permit/inspection process is inefficient, consider establishing an online residential PEV charging station specific permitting process and inspection self-certification (by electrician)

## Zoning

- Consider supporting homeowners/business requests to install off-street driveways/parking when a PEV charging station(s) will be installed.

# Process – Parking Garage Recommendations

## Charging at City-Owned Parking Issues/Options

- **Parking spot turning over**
  - Proposed solution: Install combination of L2 and L1. L1 for $0 fee incentivizes use of low-cost hardware/lower demand charges. Charge escalating fee/ticket L2 charger use after X hours to incentivize spot turnover/maximized charger use.

- **Too many PEV charger parking spots (decreased service level for conventional vehicle parking customers)**
  - Proposed solutions:
    1. Install a low number of chargers (L2 and L1) → Collect/analyze usage data every 3/6/12 months → Determine when additional chargers/program changes are needed. Grow to meet demand,
    2. (*If Circulator bus service is approved*) consider installing chargers at nearby stadium and have bus route include stadium.

- **Perception of conventional vehicle parkers when PEV parking is in prime locations**
  - Proposed solution: Install chargers in locations that minimize installation costs (i.e., by electrical service panels); likely not in prime locations.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# Progress Assessments and Plan Updates

## Annual Progress Assessments and Plan Updates

- Update resident population, vehicle population, charger population → Update public PEV charger (city- and private-owned) projections
- Analyze use of PEV charger network at city-owned facilities → understand the usage, identify successes, identify issues/develop solutions, and determine where additional PEV chargers are needed to update the long-term plan.
- Update the PEV charger usage and parking rules for city-owned parking facilities → correct any issues/to maximize charger usage and parking spot turnover.
- Update the City's outreach and partnership activities should to adapt to any changes to overcome gaps in knowledge and acceptance of PEVs.


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# Thank you


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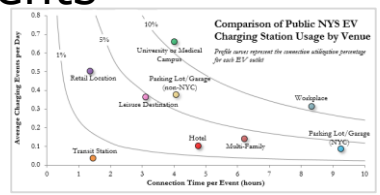
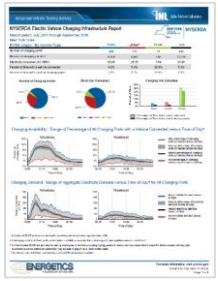
# Backup Slides

# Other EV-Related Projects

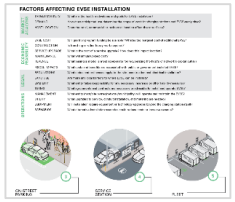
# NYSERDA: Charging Station Deployment Support

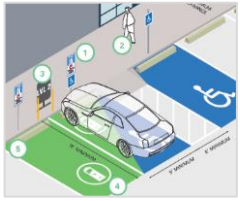
- Charge NY program established to help plan for 30,000 plug-in electric vehicles by 2018 and 1 million by 2025. (3,000 EVSE by NYS)
- Oversight of infrastructure deployment throughout New York State
  - Detailed database of installations (700+ charging ports)
  - Analysis of individual charging events
  - Reports on station utilization

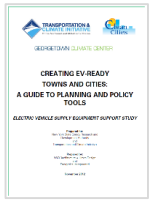


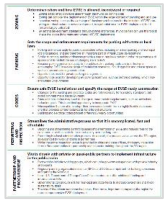



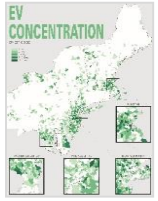
- Developed guidelines and model documents to facilitate the deployment of charging stations across Northeastern U.S. states





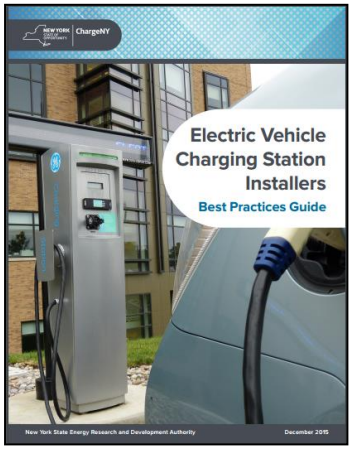


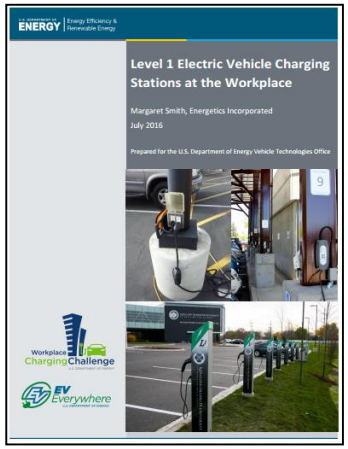
- Created outreach materials to disseminate key information about EVs and charging stations to consumers
  - e.g., brochures, website:

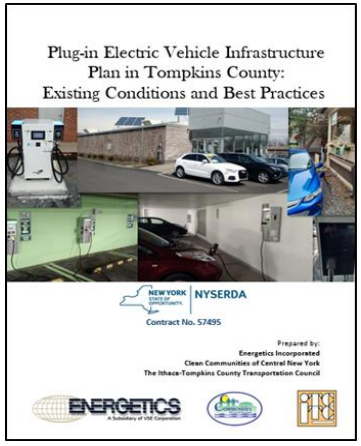
www.nyserda.ny.gov/Cleantech-and-Innovation/Electric-Vehicles

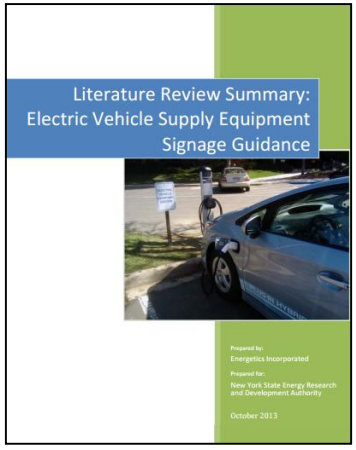

# NYSERDA: Charging Station Deployment Support

Development of Planning, Data Analysis, and Guidance Resources




# EV Market Animation in New York State

CLIENTS/PARTNERS

NEW YORK STATE OF OPPORTUNITY. | NYSERDA

## PROJECT OBJECTIVE

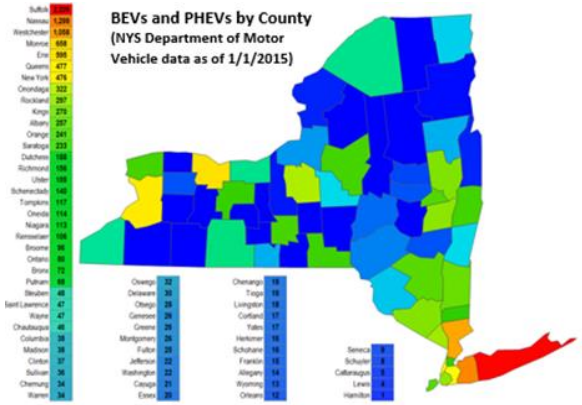
Stimulate and expand the market for electric vehicles in New York State

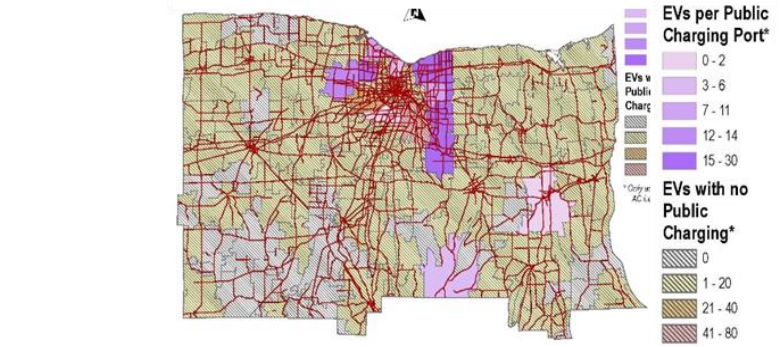
## ACTIONS/STRATEGY

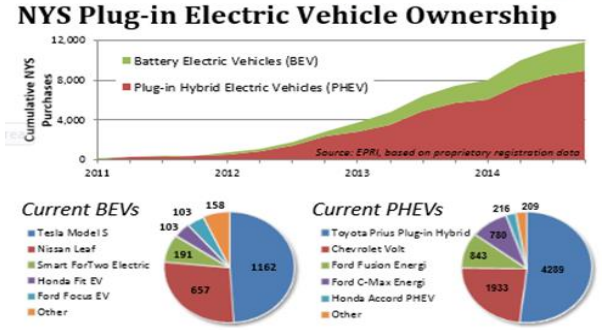
Developing innovative solutions to stimulate and expand the market for EV purchases, including a multiple-pronged approach of installing EV charging stations and conducting targeted outreach for a variety of stakeholders.

## PRODUCTS/DELIVERABLES

- Community engagement to inform and educate residents and businesses throughout the state about the benefits of EVs
- Well-recognized branding and media/social media campaigns to amplify reach
- Aggregation strategies to accelerate demand
- EV Tourism plans



# Developing Model EV Communities

CLIENTS/PARTNERS

NEW YORK STATE OF OPPORTUNITY. NYSERDA

Electrification Coalition

ROCHESTER EV ACCELERATOR

## PROJECT OBJECTIVE

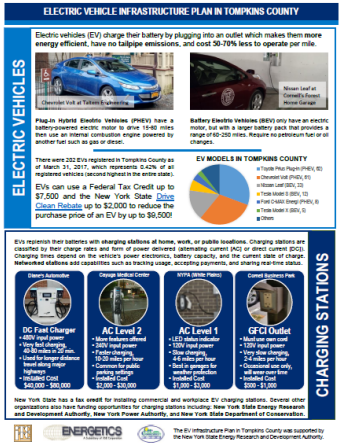
Innovative, community-wide initiative aimed at achieving widespread deployment of electric vehicles (EVs) that displace petroleum.

## ACTIONS/STRATEGY

Collaborate with public and private sector leaders to facilitate the necessary infrastructure, educational outreach, coordination, and commitment from local businesses to establish a model EV accelerator community.

## PRODUCTS/DELIVERABLES

- EV infrastructure planning
- Community outreach to expand municipal, state, and private industry participation in the EV Accelerator.
- Technical assistance strategies and tactics to help inform and educate prospective charging station site owners and EV owners.
- Outreach and marketing through Ride & Drive events, Drive Leadership program, local and national media coverage, workplace charging workshops, monthly newsletters and blogs, and daily social media.



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# Developing U.S. National EV Strategy & Implementation Plans

CLIENTS/PARTNERS

## PROJECT OBJECTIVE

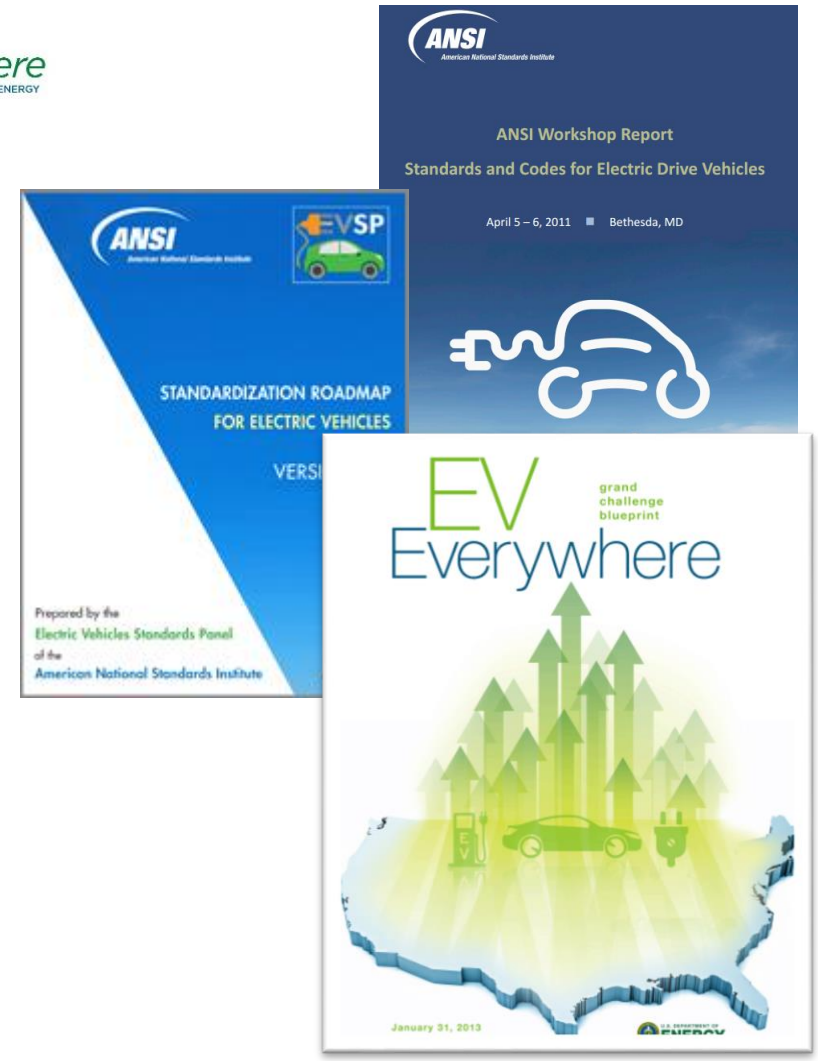
Led facilitation of two significant workshop on developing a national vehicle electrification strategy, as well as the development of codes, standards, and related programs needed for successful introduction and widespread acceptance and deployment of EVs

## ACTIONS/STRATEGY

Participants worked collaboratively through presentations, Q&A, and breakout discussions to identify the issues, gaps, and make recommendations for additional standards and programs that may be needed. Based on workshop recommendations EV Standards Panel was formed which developed a Standardization Roadmap.

## PRODUCTS/DELIVERABLES

- Facilitation plan for the 2 day workshop with 3 breakout sessions and more than 200 stakeholders
- Lead facilitator for the 2 day workshop, leading three breakout sessions facilitations each of 2 days
- Technical input to final report and standardization roadmap
- EVSP facilitation and technical contributions



# Other Related Projects

# Automated Vehicle Energy Impact Projections

CLIENTS/PARTNERS

eia U.S. Energy Information Administration

## PROJECT OBJECTIVE

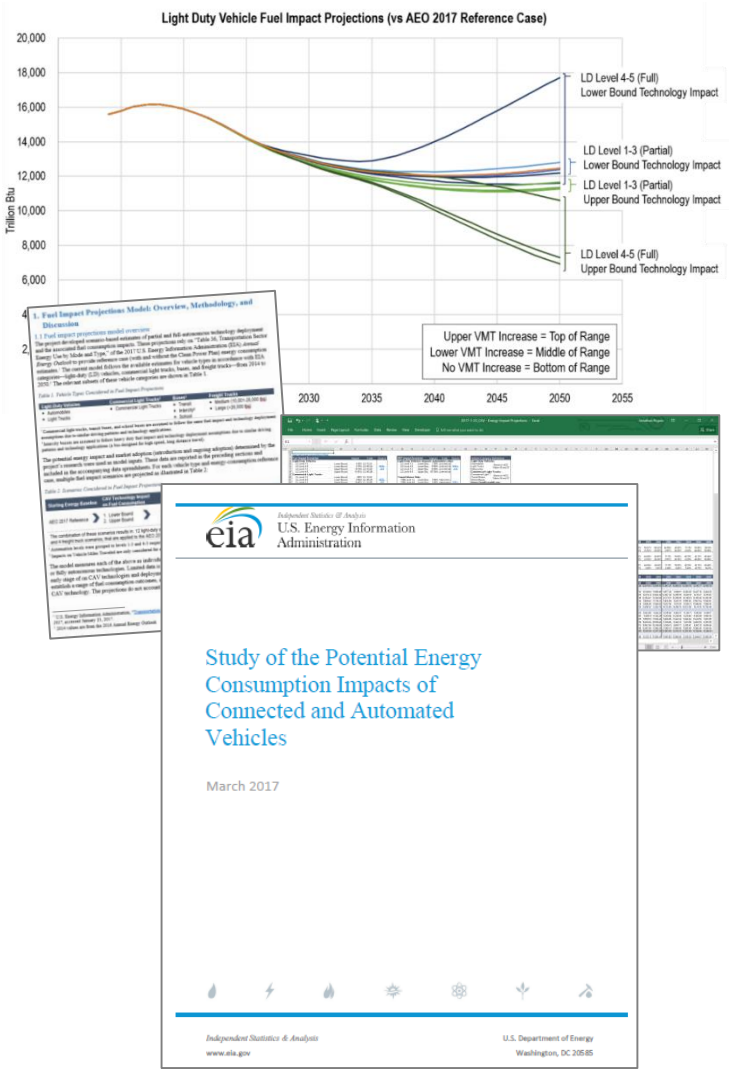
Develop an industry understanding of relevant automated vehicle technologies, developers, manufacturers, anticipated timing, and potential energy use impacts. Information was used to inform the client and develop high-level scenario-based energy use estimates for partial-/full-automated vehicle deployment out to 2050.

## ACTIONS/STRATEGY

The energy use projections rely on the 2017 U.S. EIA Annual Energy Outlook to provide reference case energy consumption estimates. The model follows the available estimates for EIA vehicle type categories (light-duty vehicles, commercial light trucks, buses, and freight trucks from 2014-2050.

## PRODUCTS/DELIVERABLES

- Comprehensive report detailing project learnings with references
- A multi-scenario fuel use impact projection tool integrating project learnings. The estimates established a range of energy consumption outcomes, influenced by multiple factors, caused by the adoption of CAV technology.
- The projections showed a potential for a wide range of energy use (reductions and increases) from autonomous vehicle deployment across all vehicle types.



# Automated Vehicle Energy Impact Projections

CLIENTS/PARTNERS

eia U.S. Energy Information Administration

Z, INC.

## PROJECT OBJECTIVE

Multi-year effort to integrate highly automated vehicles and Mobility as a Service (MaaS) into EIA's National Energy Modeling System (NEMS) Transportation Module.

## ACTIONS/STRATEGY

- Assess technology approaches and impact on vehicle cost, weight, fuel economy, and other attributes
- Determine applicability in various markets, including MaaS and transit, and incorporate into fleet and consumer behavior model
- Evaluate and model vehicle and system impacts, including vehicle use and life, travel demand by various modes, vehicle efficiency, and system efficiency

## PRODUCTS/DELIVERABLES

- Develop model approach, algorithms, and structure that seamlessly integrates with existing NEMS code
- Develop equations, model code, and data inputs
- Update and enhance the NEMS input and output files
- Maintain thorough and accurate documentation